CLAIMS:

1. An apparatus for selectively controlling the direction of a well bore comprising:

a mandrel rotatable about a rotation axis;

a direction controller comprising at least two parts configured to apply a force to said mandrel with a component perpendicular to the said rotation axis;

a housing having an eccentric longitudinal bore forming a weighted side and being configured to freely rotate under gravity; and

a driver for selectively varying the angle of the force relative to the weighted side of the housing about said rotation axis, the driver being configured to move the two parts independently of one another.

2. The apparatus of claim 1, wherein said direction controller is configured to provide a force to said mandrel at a point either above or below a centre line of said housing and said centre line is halfway along the length of the housing in the direction of the rotation axis.

3. The apparatus of claim 1, wherein said at least two parts are configured to apply a null force to said mandrel.

4. The apparatus of claim 1, wherein the direction controller comprises a sleeve with an eccentric bore to receive said mandrel, said driver being configured to selectively rotate said sleeve about the rotation axis relative to the housing.

5. The apparatus of claim 4, wherein said sleeve comprises a first part which has a sleeve with an eccentric bore and a second part which has a sleeve with an eccentric bore.

6. The apparatus of claim 4, wherein said sleeve comprises a first part which has an eccentric bore and a second part which has a concentric bore, wherein the first and second parts are located on opposite sides of the centre line of the housing.

7. The apparatus of claim 5, wherein the drive means is configured to move at least two parts of said sleeve independently of one another.

8. The apparatus of claim 7, wherein said two parts are configurable to provide a null force on said mandrel.

9. The apparatus of claim 4, wherein said sleeve is at least partially located within said eccentric bore of said housing.

10. The apparatus of claim 1, wherein the direction controller comprises a plurality of cams.

11. The apparatus of claim 10, wherein a first part of the direction controller comprises a first cam and a second part of the direction controller comprises a second cam, the driver being configured to move the first and second cams independently relative to one another.

12. The apparatus of claim 11, wherein the cams are configurable so that the direction controller provides a null force on said mandrel.

13. The apparatus of claim 1, wherein a first part of the direction controller comprises a cam and a second part of the direction controller means comprises a sleeve with a concentric bore.

14. The apparatus of claim 1, wherein the direction controller comprises at least one linear actuator for applying the force with a component perpendicular to the rotation axis of the mandrel.

15. The apparatus of claim 1, wherein a first part of the direction controller comprises a first linear actuator and a second part of said direction controller comprises

a second linear actuator, the first and second linear actuators being independently moveable.

16. The apparatus of claim 15, wherein the linear actuators are configurable to provide a null force on said mandrel.

17. An apparatus for selectively controlling the direction of a wellbore, the apparatus comprising:

a mandrel which is rotatably about a rotation axis;

a direction controller comprising at least one linear actuator configured to apply a force to said mandrel;

a housing having an eccentric longitudinal bore and being configured to freely rotate under gravity; and

a drive means for selectively varying the angle of the force relative to the weighted side of the housing about said rotation axis.

18. The apparatus of claim 1, further comprising a plurality of stabiliser shoes provided on the outside of said housing.

19. The apparatus of claim 18, wherein the plurality of stabiliser shoes are circumferentially offset by a predetermined amount in relation to the weight of said housing.

20. The apparatus of claim 18, having two stabiliser shoes.

21. The apparatus of claim 1, wherein the driver is configured to change the direction within a tolerance of at most 5°, more preferably at most 1°.

22. The apparatus of claim 1, wherein the driver comprises an hydraulic or electric motor or the like.

23. The apparatus of claim 1, further comprising logic means for determining when the direction of the force applied by said direction controller should be moved.

24. The apparatus of claim 23, wherein said logic means comprises a sensor for sensing drilling parameters and decoding such parameters to determine when the direction of the force applied by said direction controller should be changed.

25. The apparatus of claim 23, wherein said logic means comprises a sensor for sensing well bore fluid flow pulses and decoding said pulses to determine when the direction of the force applied by said direction controller should be changed.

26. The apparatus of claim 23, wherein the logic means further comprises means for decoding and commanding said driver to change the direction of said force relative to the housing.

27. The apparatus of claim 23, wherein said driver and said logic means are stored with said housing.

28. The apparatus of claim 23, wherein said logic means are located within a tubular housing connected at least one of the mandrel, direction controller or housing.

29. The apparatus of claim 23, further comprising an energy source for supplying power to the driver and/or the logic means.

30. The apparatus of claim 1, wherein the mandrel comprises a longitudinal bore and said bore is capable of passing wellbore fluids.

31. The apparatus of claim 1, further comprising signalling means for signalling the direction of the force relative to the heavy side of the housing.

32. The apparatus of claim 24, wherein said mandrel is connected to a drill string wherein said drilling parameters include drill string rotation and said logic means

includes means for detecting drill string rotation wherein said drill string rotation determines when direction of the force is changed with respect to said outer housing.

33. The apparatus of claim 24, wherein said mandrel is connected to a drill string wherein said drilling parameters include drill string rotation and said logic means includes means for detecting drill pipe rotation wherein said drill string rotation determines said radial position of said apparatus.

34. The apparatus of claim 24, wherein said mandrel is connected to a drill string wherein said drilling parameters include drill pipe rotation and said logic means includes means for detecting drill string rotation and determining a time period between rotation and non-rotation of the drill string wherein said time period determines when the angle of said force should be changed with respect to the weighted side of said housing.

35. The apparatus of claim 24, wherein said mandrel is connected to a drill string, wherein said drilling parameters include drill string rotation and said logic means includes means for detecting drill pipe rotation and determining a time period between rotation and non-rotation of the drill string wherein said time period determines said radial position.

36. The apparatus of claim 4, wherein said mandrel has an interior, said housing has an exterior, and said sleeve has a first axial position and a second axial position with respect to said housing, and wherein said signalling means comprises a series of drilling fluid passageways extending generally radially through said mandrel, said sleeve and said housing such that, when said sleeve is in said first position, said series of drilling fluid passageways align with each other so as to allow drilling fluid to flow readily from said interior of the said mandrel to said exterior of said housing accompanied by a relatively low pressure drop, and when said sleeve is in said second position, said drilling fluid passageways are in misalignment so as to restrict drilling fluid flow from said interior of said mandrel to said exterior of said housing accompanied by relatively high pressure drop.

37. The apparatus of claim 36, wherein a bit-jet and orifice combination is positioned within said generally radial passageway in said mandrel adjacent said sleeve.

38. The apparatus of claim 1, further comprising a sensor assembly for sensing information about said geological strata which is being drilled.

39. An apparatus for selectively controlling the direction of a well bore comprising:

a mandrel rotatable about a rotation axis;

a direction controller configured to apply a force to said mandrel with a component perpendicular to the said rotation axis;

a housing having an eccentric longitudinal bore forming a weighted side and being configured to freely rotate under gravity;

a driver for selectively varying the angle of the direction of force about said rotation axis; and

a sensor assembly for sensing information about said geological strata which is being drilled.

40. The apparatus of claim 39, wherein said sensor assembly comprises a sensor for sensing said information and an analyser for analysing data from said sensor, wherein said analyser is located at said mandrel, housing and direction controller combination.

41. The apparatus of claim 40, wherein said sensor is configured to sense gamma rays.

42. The apparatus of claim 39, wherein said drive means controls the angle of the direction of the force on the basis of the sensed geological data.

43. An apparatus for drilling a well bore, the apparatus comprising:

a drilling member configured to drill in a predetermined drilling direction;

direction controller for controlling the drilling direction of said drilling member;

a sensor for determining at least a characteristic of the strata being drilled;

wherein said direction controller determines the drilling direction based on the data collected by said sensor.

44. The apparatus of claim 43, wherein said direction controller is located with said drilling member, such that said drilling member can determine a preferential drilling direction based on data from said sensor.

45. The apparatus of claim 43, wherein at least a part of said direction controller means is remote from said drilling member.

46. The apparatus according to claim 43, wherein said drilling member comprises an apparatus according to claim 1.

47. The apparatus of claim 1, wherein said driver comprises a drive wheel and a track, said drive wheel being engagable with said track such that movement of said drive wheel causes movement of said track relative to said drive wheel and said drive wheel when stationary prevents movement between said track and drive wheel, the drive wheel and track being located such that movement of the drive wheel effects relative movement between the force and the weighted side of the housing.

48. The apparatus of claim 47, wherein said track is located on a surface of said housing and said drive wheel is mechanically connected to said direction controller.

49. The apparatus of claim 47, wherein the track is located on an inner surface of said housing.

50. The apparatus of claim 47, wherein said track is located on a surface of said direction control means and said drive wheel is mechanically connected to said housing.

51. The apparatus of claim 50, wherein the track is located on an outer surface of said direction control means.

52. The apparatus of claim 47, wherein said drive wheel comprises a plurality of teeth about its edge, and said track comprises a plurality of teeth which are configured to interlock with the teeth of said drive wheel to effect relative movement therebetween.

53. The apparatus of claim 47, wherein the direction of the force is changed by a predetermined angle in response to rotation of said drive wheel through a predetermined rotation angle.